

# RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, DECEMBER 2019

FIRST YEAR (BATCH 2019-22)

CHEMISTRY (General)

Paper : I

Date : 16/12/2019

Time : 11 am – 1 pm

Full Marks : 50

[Use a separate Answer Book for each Group]

## Group – A

### Unit-I

Answer any one question:

[1×10]

1. a) Write short notes on following:

[3 × 2]

- (i) E<sub>1</sub> elimination
- (ii) Hoffmann elimination
- (iii) S<sub>N</sub>2 reaction

b) Draw the Fischer projection formulae of meso and active forms of 2,3-dibromobutane.

[2]

c) Which one in each of the following pair is more nucleophilic and why?

[1 × 2]

- (i) RO<sup>-</sup> and RCOO<sup>-</sup> (ii) NH<sub>3</sub> and H<sub>2</sub>O

2. a) Define the terms with examples: enantiomer and diastereomer.

[2]

b) Write the product of the following reaction with detailed mechanism.

[3]



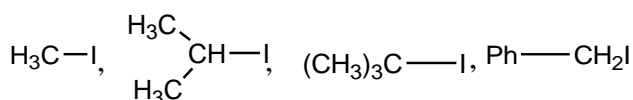
c) Define the following terms with example of each

[2×1.5]

- i) Plane of symmetry
- ii) Alternative axis of symmetry

d) Arrange the following molecules in increase order of S<sub>N</sub>1 reactivity with reasons.

[2]



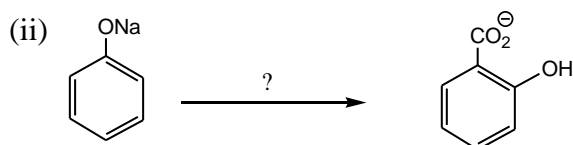
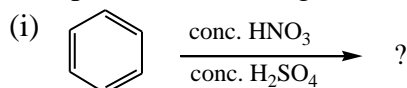
### Unit-II

Answer any one question:

[1×10]

3. a) Complete the following reactions with mechanism:

[2 × 2]



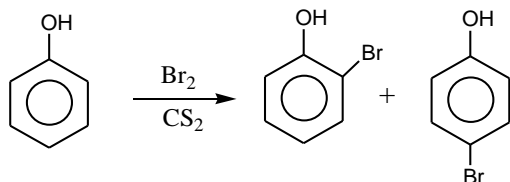
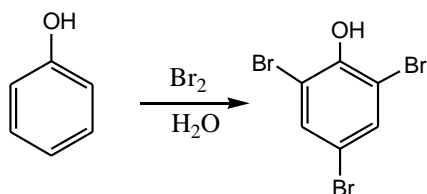
b) Write the demerits of Friedel-Craft's alkylation and also describe the advantages of Friedel-Craft's acylation for the preparation of n-propyl benzene.

[2+2]

c) Give one suitable reaction to prepare 1° amine.

[2]

4. a) Explain the following product formation with reasons. [2]



- b) Give the chemical reactions for identification of  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  amines. [3]  
 c) Write the mechanism for preparation of salicylaldehyde from phenol. [3]  
 d) Between ortho nitrophenol and para nitrophenol which one is more acidic and why? [2]

### **Group – B** **Unit-I**

**Answer any one question:**

[1×10]

5. a) Write the shapes of the following compounds on the basis of VSEPR theory. [3]  
 (i)  $\text{SF}_6$   
 (ii)  $\text{H}_2\text{O}$   
 (iii)  $\text{PCl}_5$   
 b) Using Born-Haber cycle, find out the lattice energy of  $\text{CaF}_2$  from the following data – [3]  
 Sublimation energy of Calcium = 201  
 First ionisation potential of Calcium = 590  
 Second ionisation potential of Calcium = 1145  
 Dissociation energy of fluorine = 159  
 Electron affinity of fluorine = – 335  
 Heat of formation of  $\text{CaF}_2$  – 1243  
 (all the values are in  $\text{kJmol}^{-1}$ )  
 c)  $\text{MgSO}_4$  is water soluble while  $\text{BaSO}_4$  is water insoluble, explain with reasons. [2]  
 d) Write notes on Fajan's rule. [2]
6. a) State radius ratio rule and mention its limitations. [3]  
 b) Explain: [2+2]  
 (i) The melting point of  $\text{NaCl}$  is higher than that of  $\text{AlCl}_3$ .  
 (ii) Melting point decreases from  $\text{CaF}_2$  to  $\text{CaI}_2$ .  
 c) Predict the shapes of the following using VSEPR - theory: [1 × 3]  
 (i)  $\text{I}_3^-$ ,  $\text{XeF}_4$ ,  $\text{NF}_3$

### **Unit-II**

**Answer any one question:**

[1×10]

7. a) Draw the approximate MO energy level diagram for  $\text{N}_2$  molecule. Compare the bond dissociation energies of  $\text{N}_2^+$  and  $\text{N}_2^-$  and explain the difference. [2+2]  
 b) Give a brief introduction of Werner theory (postulates) regarding coordination complex. [3]

- c) What are polydentate and flexidentate ligands? Give example. [3]
8. a) Draw the qualitative MO diagram of HF molecule and comments on its bond polarity and bond order. [2+2]
- b) Write the IUPAC nomenclature of  $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$ . [2]
- c) How will you distinguish between: [2]  
 $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$  and  $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$
- d) What is innermetallic complex? Give one example. [2]

### Unit-III

**Answer any one question:**

9. a) Discuss the preparation and structure of diborane. [1×10] [3]
- b) Compare and contrast the properties of Boron and Aluminium considering the points: [2]  
 (i) Oxides (ii) Halides
- c) Write a note on Inert pair effect. [2]
- d) Show that Hydrozine has both oxidising and reducing properties. [3]
10. a) Give the preparation and two uses of any two of the following: [2×3]  
 (i) Hydroxylamine  
 (ii) Interhalogen  
 (iii) sodium thiosulphate
- b) Compare  $\text{NH}_3$ ,  $\text{PH}_3$  and  $\text{AsH}_3$  with respect to (i) Basic strength (ii) Reducing properties. [2]
- c) How hydroxylamine is prepared? [2]

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